Visual media as a tool to acquire soft skills — cross-disciplinary teaching-learning project SUFUvet

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Structured Abstract

Purpose – SUFUvet is a cross-disciplinary teaching-learning project designed to adapt students' soft skills and track usability and the concrete surplus value of work techniques in the field of visual media design.

Design/methodology/approach – For SUFUvet, a collaboration between the Institute of Food Hygiene/University of Leipzig and the Media Center/Technische Universität Dresden was initiated. Bachelor students of media informatics generate 3D visualisations in the framework of SCRUM: Undergraduate veterinary students issue instructions in order to create an e-learning class. During the project, questionnaires, group discussions, and feedback methods are used to detect changes in selected soft skills.

Originality/value – This design is meant to increase knowledge and employability by adapting student's media, communication, and project management competences. Using SCRUM appears to be a new approach, not only in the field of programming, but for media production as well. Additionally, it offers an interdisciplinary work environment, which is rare but considered fruitful within university studies.

Practical implications – The outcomes of the application are a 3D-visualised meat inspection e-learning class for veterinary students plus a documentation of SCRUM as a framework for visual media design. It is seen as an experiment for future applications in a variety of cross-disciplinary learning and media design cases.

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Keywords – didactical development, soft skills, cross-disciplinary e-learning, veterinary study, study of media informatics

Paper type – Method Paper / Practical Paper

1 Introduction

The demands on university education and, in particular, on the understanding of educators' and students' roles have changed remarkably over time from teacher-centered to learner-centered education and from content-based to competence-based curricula (Bergsmann et al., 2015). In addition to pure knowledge acquisition, also named hard skills, the necessity of learning so-called soft skills is attracting more and more attention from educators and students (Shakir, 2009). Students expect a "holistic development as learners and human beings" (Nikitina and Furuoka, 2012). A common definition of soft skills comprises seven categories, namely, communication skills, critical thinking and problem-solving skills, teamwork, lifelong learning and information management skills, entrepreneurship skills, ethics and professional morals, and leadership skills (Shakir, 2009). These competencies are important prerequisites for a modern, highly project-driven professional culture. Both in the study of veterinary medicine and in media informatics, the application of these skills is estimated to be very important – either in anamnesis (Byron et al., 2014; Kinnison et al., 2014) or in stakeholder communication (Itani and Srour, 2016). Nevertheless, there are currently no suitable courses available for acquiring these soft skills; any such programs are most often conducted within internships. In addition, the change of perspective and intense contemplation have a positive influence on the development of soft skills (Shelley, 2015).

Therefore, the aim of this study is to develop and train certain soft skills in a problem-based learning (PBL) scenario in which the students reflect their needs as learners and switch into the role as teachers and product owners. Since the intended outcomes are 3D visualisations and other visualisations within the framework of an e-learning course, this approach can also be known as the Learners as (Multimedia) Designers approach (Lehrer et al., 1995). Previous studies in this matter showed evidence that "(1) learners develop critical thinking skills as authors, designers, and constructors of knowledge and (2) learn more in the process than they do as the recipients of knowledge prepackaged in educational communications" (Jonassen and Reeves, 1996).

2 SCRUM as a framework for visual media design

SCRUM is "[a] framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value" (Schwaber and Sutherland, 2013). Basically, SCRUM structures workflows and responsibilities throughout problem-based and goal-oriented projects. It has been used since the early 1990s (Schwaber and Sutherland, 2013) and been approved many times for software and web engineering processes (e.g. Park et al., 2016). The complexion of programming (see Figure 1) allows a cut-through of the

overall task: Created subtasks are rather independent from one another, which, therefore, leads to intermediate results that are more approachable in less time. A main aspect of SCRUM as a management and control process is teamwork and tracking work progress as well as advancements on a regular basis.

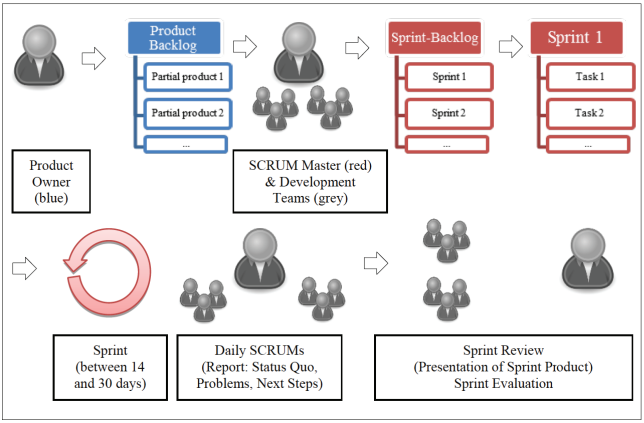

Figure 1: Regular SCRUM procedure (Schwaber and Sutherland, 2013)

Now, how can this method be applied to media design? For this project, slight modifications of the SCRUM framework have been made. This applies to both SCRUM meeting intervals plus several roles within the framework as can be seen in the following Figure 2.

One of the main challenges in using this method as a framework for this project is to split overall visualisation goal(s) into independent subtasks that can be prioritized freely by each person in a design team. Visualisation tasks, within the meaning of SCRUM, shall not consist of a single person task or dependent subtasks as it would make nonsense of design team work. If it succeeds in generating feasible product and sprint backlogs, using SCRUM has the potential to adapt students' competences such as team, planning, and communication skills. In this project, it shall be investigated how both product and sprint backlog can be successfully created within media design and if there is a surplus value of this method – in addition to the theoretical SCRUM knowledge and media engineering literacy that is supposed to be facilitated.

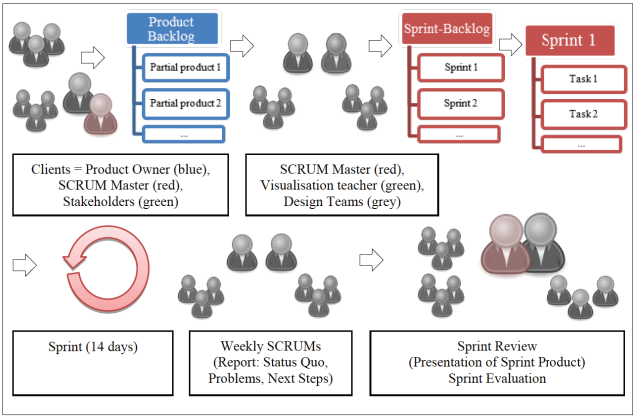

Figure 2: SCRUM alteration in the project SUFUvet

3 Cross-disciplinary educational project SUFUvet

SUFUvet is a pilot project between the Media Center/Technische Universität Dresden with students of media informatics and the Institute of Food Hygiene/University of Leipzig with undergraduate veterinary students (preclinical and clinical part). As study design, a PBL scenario was chosen, which has been shown to facilitate the development of soft skills (Riggio and Saggi, 2015). Content of this cross-disciplinary project in the joint research project "Lehrpraxis im Transfer (LiT)" is the creation of a multimedia, 3D visualised teaching-learning class about ante-mortem and post-mortem meat inspection of domestic swine.

The visualisation of carcases, offal, and gastrointestinal tracts of pigs is the link between the students of media informatics and veterinary medicine in this project. The aim of the study – to develop and train the students' soft skills – is reached by two aspects: (1) Reflecting the needs as learners and switching into the roles of teachers, product owners, or designers and (2) applying the framework of SCRUM.

Planning behaviour, personal responsibility, and ability to cooperate (translated from German: Planungsverhalten, Eigenverantwortung, Kooperationsfähigkeit) are the chosen soft skills to be evaluated. Each of them covers a different field of competency regarding the KODE®-, KODEX®-system (Erpenbeck, 2009). Planning behaviour represents a professional-/methodic competence (German: Fach- und Methodenkompetenz), personal responsibility a personal competence (German: personale Kompetenz), and the ability to cooperate a social-communicative

competence (German: sozial-kommunikative Kompetenz). Especially planning behaviour is supposed to be trained by applying the well-structured process of SCRUM. The personal responsibility of media informatics students is trained by creating the 3D models of pigs independently during the SCRUM-sprint. Concerning veterinary students, personal responsibility is trained by (1) generation of expectations for the 3D models and (2) additional videography and photography for the e-learning class. The ability to cooperate is trained by cooperative and collaborative work (1) between media informatics and veterinary students during the SCRUM-sprint planning meeting and sprint review meeting, (2) within the groups of media informatics students that work together on a 3D model, and (3) within the groups of veterinary students that plan the structure and content of the e-learning class and create the videos and pictures about meat inspection.

3.1 General structure of the project

The collaboration within SUFUvet occurs between different student groups which were asked to participate on a voluntary basis. Both groups are headed by a scientific assistant and coordinated by a graduate assistant (see Figure 3).

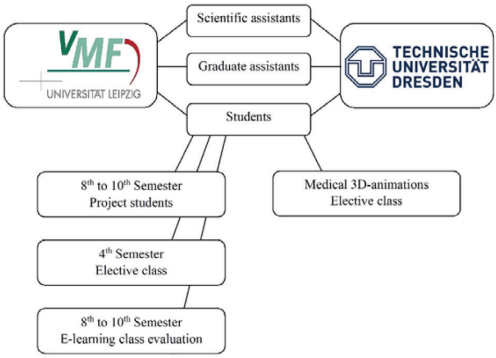

Figure 3: Structure of persons involved in the project SUFUvet

The bachelor students of media informatics take part within an elective class about medical 3D animations.

In veterinary study, students have to participate in a certain amount of elective classes too. Four veterinary students (three from the 8th and one from the 10th semesters) chose SUFUvet as a scientific student project, which has to be successfully

completed for admission to the state examination. In groups of two, they created an e-learning class about ante-mortem and post-mortem meat inspection. Their work is supplemented by contributions of 4th semester veterinary students, who take an elective class about ante-mortem or post-mortem inspection and work out basic information with the knowledge they have already achieved.

The project is completed with the support of external professionals. (1) A reflection on the learning experience and role switching of students is guided by a psychologist, who also trains them in technologies of communication and time management. (2) An external professional teaches the SCRUM concept to everyone involved. (3) The students of media informatics are introduced to a 3D animation software by an external professional. (4) The veterinary students receive further information and material from a veterinary and food control authority.

A formative assessment will take place to monitor the quality of the project, which includes periodical questionnaires and student feedback sessions. Moreover, the intelligibility of the created visual learning materials will be tested periodically by key users (Krug, 2006).

3.2 Importance of visualisation

Within SUFUvet, the relevance of visualisation becomes apparent regarding the following aspects:

(1) Visualisation in this project builds a feasible and naturally perceptible common ground for cross-disciplinary communication (Tversky, 2005). The 3D models and their visualisation are also intended to work as boundary objects within the cooperation (Star and Griesemer, 1989), e.g. for idea exchange and quality negotiation. (2) A creation of visual representations fosters an intensive understanding of the represented objects and e.g. their physical properties (Mintzberg and Westley, 2010). (3) Visual media – especially when combined with other media as dual coded assets (Paivio, 2006) – facilitate a deep understanding and learning effect for complex objects (Nelson et al., 1976, Nelson. 1979).

For veterinary students: Previous didactic research elucidated the students' preferences for mixed method learning within medical studies (Bhagat et al., 2015, Marwaha et al., 2015). Students are aware of different learning styles and try to adapt different learning strategies (Bhagat et al., 2015). Visualisations, especially by means of 3D models, may be one of those and are often described in human medical anatomy classes. Students appreciated working with this kind of visualisation and, additionally, showed an increased learning outcome afterwards (Allen et al., 2016).

Furthermore, 3D models also led to a better anatomic understanding (Pujol et al., 2016). This is also applicable to the study of veterinary medicine in general and, particularly, in post-mortem meat hygiene. The students have to examine carcases, offal, and gastrointestinal tracts and inspect the different lymph nodes (visual inspection, palpation, and incision of the lymph nodes are trained). Therefore, the enhanced visualisation which will be developed within SUFUvet is considered useful to increase the learning outcome as well.

For media informatics students: In their elective class, the development of 3D visualisations is a key for the support of several dimensions of e.g. Baacke's "Medienkompetenz" (can be translated as "media literacy", although the English term has different definitions): Firstly, students are taught what 3D models are, what types exist, and what they are used for or how they are created. This is knowledge gained about 3D visualisation ("Medienkunde"). Secondly, they are taught how these models can be created step by step in the 3D visualisation software "3dsMax". Therefore, they are given the opportunity to learn how to use this software receptively and practically ("Mediennutzung", "rezeptiv, anwendend"). Last but not least, they build their own 3D visualisations using this knowledge in a prospectively creative way ("Mediengestaltung"). (Baacke, 1999)

This supportive environment for 3D-visualisation-"Medienkompetenz" is considered valuable in combination with the opening of the medical visualisation market for future media informatics graduates.

4 Research interest I: Planned evaluation of SCRUM

A primary goal of formative assessment is "to provide feedback to teachers and students over the course of instruction" (Boston, 2002, p. 1). Generally, formative assessment practices comprise a variety of methods for a longitudinal evaluation: (1) learner driven self-assessment methods as portfolios or learning diaries (Winter, 2008), (2) group-assessments like classroom discussions, or (3) a monitoring through records or performance indicators (Lynch et al., 2004). In contrast, a summative approach is generally proposed to evaluate competencies or outcomes at a specific time and "sums up the performance or learning level of achievement" (Dumit, 2012, slide 10). Due to the periodic and intensive process documentation, SCRUM frames offer various opportunities for both formative and summative assessment. For instance, Igaki et al. (2014) conceived a ticket-driven evaluation of workflow progress and assessed the team performance of a SCRUM-based team PBL scenario in information sciences university education. Similar, Santos and Pinto (2013) practiced team performance monitoring employing SCRUM and – as a similar project management approach – Kanban within a training course in Software Engineering. From a methodological

perspective, an assessment within this latter research work took place for both content and process quality at the end of each sprint and was performed by team supervisors according to previously defined assessment guidelines. While both approaches evaluate and compare team performance, Scharf and Koch (2013) developed criteria to assess an involvement of individual students into a SCRUM-based project-based learning course. Comprehensively, the assessment model developed by Vasilevskaya et al. (2014) proposes a comprehensive evaluation scheme for SCRUM.

Table 1: Perspectives and types of assessment proposed to be used (according to Santos and Pinto, 2013; Vasilevskaya et al., 2014)

Assessment Perspectives	Formative	Summative	Instrument
Process	x	-	Moderated group discussion during retrospective
Output	-	x	Backlog analysis Guideline-based peer-review on outcomes
Performance	x	-	Teacher-based assessment Questionnaires on skill development
Client	-	x	Client feedback via questionnaire

An overall assessment within the proposed PBL course arrangements is intended to take place via combined formative and summative assessment stages. According to this scheme, assessment instruments in the context of the proposed PBL course will be (c.f. Table 1):

Process quality will be assessed at the end of each sprint within a moderated group discussion during the retrospective. Main questions which are discussed include: "(1) What was good in the iteration?, (2) What did not go well?, and (3) How can we improve?" (Vasilevskaya et al., 2014)

Performance assessment takes place at the end of each sprint via a teacher-based assessment, according to a criteria catalogue developed by Santos and Pinto (2013). Moreover, an overall competency development regarding soft skills will be examined by using questionnaires.

An Output assessment will take place via a guideline-based peer review of each team's results in the final session. Additionally, a retrospective analysis of the backlog of each project by involved teachers provides clues on the grade of objective achievement.

Client satisfaction will be summatively assessed by a guideline-based questionnaire answered by the involved veterinary medicine students in Leipzig.

5 Research interest II: Planned evaluation of skill advancement

This teaching-learning project focuses on the three soft skills "planning behaviour", "personal responsibility", and "ability to cooperate", which each concerns one core competency (Erpenbeck, 2009).

Of course, the possibilities of skill measurements are rather unsatisfactory. How would one investigate a person's competencies or his/her skill improvement? From a theoretical and pedagogical point of view, this is rather impossible. Most of all, one cannot reduce a person's competence to their answers to a series of questions (e.g. clarified by Schorb, 2014), although there are researchers who do so (e.g. Kommer 2010).

Regarding the character of being a pilot project, the authors still decide to indicate changes by the following three psychological questionnaires, which are completed by all students involved at the beginning and the end of the term. To ensure the assignability of all questionnaires and guarantee the privacy of all participants, each student signed all questionnaires with an individual, secret personal code.

1) The questionnaire testing "planning behaviour" was developed by Grob and Maag Merki (2001, pp. 513-518, pp. 528-543) and consists of 15 items with a verbalised four-step response scale. Of these 15 items, five items each measure planning strategies, elaboration strategies, and monitor behaviour compared to the aim.

2) The skill "personal responsibility" is tested by using a psychometrically proved creative common (CC BY-NC-ND 3.0) questionnaire from Bierhoff et al. (2005a). The questionnaire is accessible within the test database PSYNDEX of the Leibiz Institute for Psychology Information and consists of 18 items with a verbalised six-step response scale (Bierhoff et al., 2005b).

3) The questionnaire regarding the skill "ability to cooperate" is also developed by Grob and Maag Merki (2001, pp. 410-424). Nine items test general ability to cooperate (verbalised four-step scale), while four items focus on the cooperation experiences during the study (3 items, verbalised five-step response scale) or in general (1 item, verbalised five-step response scale). One item also questions the personal assessment of cooperation income (verbalised four-step response scale).

These questionnaires have been chosen because (1) they seemed most suitable to indicate the status of the three described skills within situations, (2) each questionnaire is short and has a comparable extent and (3) the questionnaires were tested at least in one test run. Furthermore, only tests available in German have been considered to

avoid additional bias from translation. The developers of these three questionnaires described satisfactory results for reliability, validity, and internal consistence of all used items within their original use. Regarding analysis, the developers of questionnaire 1) and 2) described the possibility to create common scores for each. The items of questionnaires 3) have to be evaluated separately. Because of the study design (e.g. lacking control group, repeated use of the same questionnaire), the results are reflected critically and only used in the matter of change indication, which can be useful for qualitative research on this topic afterwards.

6 Summary and outlook

SUFUvet is in several respects a pilot project. The collaboration and cooperation within each level (research and graduate assistants, students) and, as mentioned above, between the participating students and the assistants are an innovation. The connection between both studies is made by the PBL scenario and realised by the SCRUM framework. So far, both student groups seem motivated to work together, although the working topic (visualisation of porcine carcase, offal, and gastrointestinal tract) is unusual and may cause bias within the design teams.

Known for its usability in informatics, SCRUM in SUFUvet is tested for visual media design. The application of this framework is a novelty as well. Despite the known use in informatics, SCRUM is now adapted for visualisation design and used in a marketplace situation by the veterinary students as product owners and the media informatics students as design teams. Except for a few of the media informatics students, the students have no previous experiences in communicating and working in this manner. Therefore, the initial phase within the framework may be reflected critically.

SUFUvet offers many possibilities to train different competencies; therefore, the authors try to indicate this development by using each of the three questionnaires at the beginning and at the end of the term. The results must be interpreted carefully and should be seen as a general tendency only. However, the authors expect that the mentored independent work of the participating students will increase the mentioned soft skills.

The experiences resulting from this cross-disciplinary teaching-learning project offer impetus for further cooperation. Other approaches can be an adaption to other “product owners”, e.g. human medicine, archaeology, or further extended multimedia learning environments for veterinary students. Regarding the competences, also service-learning (Bringle and Hatcher, 1996) ought to be considered in order to enhance the training of soft skills and, thus, to improve the necessary practical, social, and teaching skills.

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